OLR RESEARCH REPORT

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YELLOW TRAFFIC SIGNAL TIMING

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You asked about the significance of the timing of yellow traffic signals, and its impact on running red lights.

SUMMARY

The yellow change interval warns traffic that the green signal has ended and that a red light is about to begin. The selection of the appropriate yellow interval length is important for both safety and traffic flow, according to A History of the Yellow and All-Red Intervals for Traffic Signals.

The yellow interval is particularly important in the context of red light running. "Research shows that yellow interval duration is a significant factor affecting the frequency of red-light running, and increasing yellow time to meet the needs of traffic can dramatically reduce red-light running," the Transportation Research Board (TRB) states, in discussing the need for further study of the issue.

YELLOW LIGHT TIMING

General Considerations

The length of the yellow light interval depends on a number of factors traffic engineers must consider, including vehicle speed, driver reaction time, braking time, and road conditions and grade.

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"A difference of one second to the length of the yellow change interval can affect the safety of the intersection," according to A History of the Yellow and All-Red Intervals for Traffic Signals. "For example, at a 60 foot wide signalized intersection with an average approach speed of 45 mph, a motor vehicle will travel the length of the intersection in nearly a second. If conflicting vehicular movements or pedestrians have begun to enter the intersection, a collision could occur in the course of that second. On the other hand, if the change interval is too long the capacity of the intersection will be decreased and the delay to motorists and pedestrians will be increased."

State regulations now require a yellow interval of between three and six seconds (Conn. Agency Regs. § 14-298-713). The federal *Manual on Uniform Traffic Control Devices*, the national standard for traffic control devices, recommends this interval, with longer intervals used on approaches with higher speeds. However, the *Manual* requires the actual interval to be determined using engineering practices (*Manual*, § 4D.26.03), and the state Department of Transportation (DOT) states it is revising the regulations accordingly.

Engineering Considerations

A preliminary draft of an Institute of Traffic Engineers (ITE) study has found that most states lack a formal policy for computing traffic signal intervals. And, while traffic engineers generally consider the same factors in determining the appropriate timing for a particular yellow signal, (e.g., driver reaction time, approach speed, and braking time), the draft report identifies at least eight different methods engineers use to make that determination. Among other things, the methods differ in the calculations used, the number and variety of factors considered (e.g., intersection width, vehicle length, probability of driver stopping) and the variables used (e.g., average vehicle speed versus the speed at or below which 85% of people drive at any given location).

Current Studies

Both ITE and the National Cooperative Highway Research Program (NCHRP) are studying yellow light timing. (NCHRP, administered by the TRB, researches highway planning, design, construction, operation, and maintenance.)

The studies focus on different aspects of yellow light timing. The ITE report will examine the current state of traffic signal timing, and provide an overview of key considerations in determining yellow light change and red light clearance intervals. The NCHRP study will incorporate new primary data into the research. Both reports are expected to be published later in 2012.

The TRB, in discussing the need for updated information, notes that the intervals used today are the result of "limited research" of driver reaction time and deceleration rates conducted 25 or more years ago. That research, TRB states, ignored "the effects of heavy vehicles… although trucks require longer distances to stop." The NCHRP study will also take into account the aging of the population in recent decades, a factor that may greatly affect average driver reaction time.

The goal of the NCHRP study is to develop guidelines for timing yellow and all-red intervals, and assess the long-term effectiveness of increasing yellow intervals on the frequency of red light running and risk of crashes. Among the questions it says it will attempt to answer: Does reduced red light running mean fewer crashes? What is the normal driver reaction time, and does it differ by driver age? Should there be an upper limit on how long a yellow interval lasts?

EFFECTIVENESS OF LENGTHENING YELLOW INTERVAL IN REDUCING RED LIGHT RUNNING

An Insurance Institute for Highway Safety (IIHS) report has found that making yellow light intervals longer itself reduced red light violations by 36%, and that the addition of red light cameras reduced these violations by 96% beyond levels achieved by the yellow light changes. According to IIHS, "this study shows that the provisions of adequate yellow signal timing reduces red light running, but longer yellow timing alone does not eliminate the need for better enforcement, which can be provided effectively by red light cameras."

The TRB, in discussing its forthcoming report, states that "there are approximately 1,000 fatalities and 90,000 injuries each year attributed to red-light running. Deficient yellow times entrap drivers into running red lights or stopping abruptly and risk being rear-ended."

TRB states that "red light cameras are being implemented with little or no grace period. Such practice fails to recognize that current practice for timing yellow lights reflect an average driver and unfairly penalizes a large number of motorists behaving reasonably. Over time, this practice could lead to a backlash against red-light cameras and prohibition of a potentially useful tool in improving highway safety."

TRB goes on to state that "data collected at several red-light camera sites in northern Virginia where the yellow was increased has yielded impressive results and suggests that increasing the yellow interval can be more effective in reducing red-light running than cameras. The dramatic reductions in red-light running from increasing the yellow have been sustained up to three years after the yellow was increased, and there is no evidence that motorists take advantage of the increased yellow over time. Further, it is very simple and inexpensive to implement. This needs to be evaluated on a wider scale and the results widely disseminated."

We also are attaching a link to an article on the timing of yellow lights in conjunction with a red light camera program in Springfield, Missouri, emphasizing the importance of ensuring that all yellow signals in a municipality are set to the same standard.

ENFORCEMENT CONSIDERATIONS: PERMISSIVE AND RESTRICTIVE LAWS

As a side note, we should point out that states not only differ in how they determine yellow light timing, but in how they handle drivers who violate the traffic signal laws. According to ITE, 37 states have what are known as "permissive" yellow light laws, under which "drivers may enter the intersection during the yellow interval and legally be in the intersection while the red signal is displayed, so long as the driver entered before or during the yellow signal indication."

The other 13 states, including Connecticut, have "restrictive" laws, under which "drivers may not enter the intersection during the yellow signal indication unless the intersection can be cleared prior to onset of red indication or unless it is impossible or unsafe to stop."

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